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Applicability of Voice Message Processing to U.S. Army Directorates of Engineering and Housing Operations
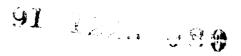
by
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Field observations at Fort Leonard Wood, MO, revealed that, during working hours, a typical U.S. Army installation Directorate of Engineering and Housing (DEH) Work Order Reception Desk may receive 500 telephone calls daily. After hours, service request calls are forwarded to the Fire Department, whose job expands to include answering, redirecting, and prioritizing both emergency and nonemergency calls. Telephone congestion causes many calls to go unanswered, or to be incorrectly processed.

A possible solution to the telephone congestion is to supplement DEH staff with a voice message processing system, which could prioritize emergency or important calls, and could fill or redirect routine information requests. This interim report summarizes an evaluation of DEH Work Order Reception practices and needs, and an investigation into commercially available voice message processing systems. The report concludes that the addition of a voice-processing system to existing DEH telephone and computer equipment can be a cost-effective way to enhance productivity of limited staff. The final planned stages of this study are to install voice message processing systems at Fort Leonard Wood and Fort Eustis, VA, and to monitor, test, and evaluate their performance and cost-effectiveness.

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Field observations at Fort Leonard Wood, MO, revealed that, during working hours, a typical U.S. Army installation Directorate of Engineering and Housing (DEH) Work Order Reception Desk may receive 500 telephone calls daily. After hours, service request calls are forwarded to the Fire Department, whose job expands to include answering, redirecting, and prioritizing both emergency and nonemergency calls. Telephone congestion causes many calls to go unanswered, or to be incorrectly processed.

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FOREWORD

This study was performed for the U.S. Army Engineering and Housing Support Center (USAEHSC), Fort Belvoir, VA, under Reimbursable Order No. E878-90217, "Interactive Telephone Research," dated May 1989. The USAEHSC technical monitor was Mr. Leo Oswalt, CEHSC-SI.

The work was performed by the Real Property Maintenance Activities Team of the Facility Systems Division (FS) of the U.S. Army Construction Engineering Research Laboratory (USACERL). The principal investigator was Mr. Donald Hicks. Mr. John Crane, Jr. and Mr. Glenn Rasmussen were associate investigators. Mr. Robert Neathammer, Team Leader, assisted with the development and supervised its progress. Dr. Michael O'Connor is Chief, USACERL-FS. The USACERL technical editor was Mr. William J. Wolfe, Information Management Office.

COL Everett R. Thomas is Commander and Director of USACERL, and Dr. L.R. Shaffer is Technical Director.

CONTENTS

APPLICABILITY OF VOICE MESSAGE PROCESSING TO U.S. ARMY DIRECTORATES OF ENGINEERING AND HOUSING OPERATIONS

1   INTRODUCTION

Background

U.S. Army Directorates of Engineering and Housing (DEHs) are large, integrated organizations whose responsibilities include the construction, maintenance, and repair of all the real property on the installation grounds. A typical installation DEH Work Order Reception Desk may receive as many as 500 telephone calls daily. After hours, service request calls are forwarded to the Fire Department, whose job expands to include answering, redirecting, and prioritizing both emergency and nonemergency calls. Telephone congestion causes many calls to go unanswered, or to be incorrectly processed.

A possible solution to the telephone congestion is to supplement DEH staff by installing a voice message processing system, which could prioritize emergency or important calls, and could fill or redirect routine information requests. However, such an automated system must first be evaluated to find if it can assist present DEH staff by cost effectively improving DEH telephone service.

Objectives

The objectives of the first part of this study were to: (1) review current practices of the DEH Work Order Reception Desk at Forts Leonard Wood and Eustis, (2) determine the unmet telephone answering needs of those DEHs, (3) identify the capabilities of commercially available voice message processing systems, and (4) recommend whether such a system could cost-effectively relieve the telephone congestion at DEH Work Order Reception Desks. Once this preliminary task is complete, the objectives of the second part of the study are to install, monitor, and evaluate the performance of the selected system at Forts Leonard Wood and Eustis, and to recommend the applicability of such systems to the DEH environment.

Approach

Phone interviews were made with personnel at the Work Order Reception Desk at Fort Leonard Wood, MO, and Fort Eustis, VA. Later, field visits were made to those two locations. To review practices at DEHs in general, phone interviews were also made with personnel at Fort Belvoir, VA, Fort Lee, VA, Fort Hood, TX, Fort Ord, CA, Fort Meade, MD, and Fort Riley, KA. A list of 49 manufacturers of voice message processing systems was compiled (Appendix A), from which six representative systems were chosen for further analysis and comparison. The remaining manufacturers were interviewed by phone to ensure that none of the unselected manufacturers offered systems with features not provided by the six selected systems.

Scope

This investigation identified, analyzed, and specified a voice message processing system for Forts Leonard Wood and Eustis. However, the study into the DEH Work Order Reception Process, and the evaluation and adaptation of a voice message processing system to that process, are relevant to all U.S. Army installation DEHs.

Mode of Technology Transfer

The field test results of this study, along with recommendations from USACERL, will be forwarded to the U.S. Army Engineering and Housing Support Center (USAEHSC) for distribution through DEH workshops. Further information will be disseminated through USAEHSC newsletters, DEH Digest, and FEAP flyers.

2   SYSTEM CONCEPT

DEH Practices

A representative DEH must serve an installation with as many as 30,000 military personnel, employees, and family members either working or residing on the installation. At Fort Leonard Wood, for instance, a total of 20,000 military personnel, employees, and family members live on base. This large population makes an average of 250 to 500 telephone calls to the DEH daily, the bulk of which come early in the work week. All nonemergency calls to the DEH during working hours are answered by the Work Order Reception Desk, which processes and routes calls appropriately, and forwards misdirected calls to other offices within the DEH. After hours, service request calls are diverted to the Fire Department, which acts on calls by their importance; all calls to the other DEH divisions go unanswered.

The primary task of neither the Work Order Reception Desk nor the Fire Department is to answer the telephone. The high volume of telephone activity routed through these two single points results in a conflict between telephone answering and primary duties. Telephone calls are often unanswered, processed out of sequence, or prioritized incorrectly. Furthermore, the current telecommunications systems on most installations have never been completely modernized; they are still composed of both touch-tone and rotary-dial (pulse) telephones. There is a need for a system that alleviates telephone congestion, creates more efficient communication within the DEH divisions, and provides continuous 24-hour telecommunications service.

DEH Needs

Consultation with the DEH personnel at Forts Leonard Wood and Eustis, and at other DEHs revealed that a typical DEH requires the following capabilities of a voice processing telecommunications system:

1. The system must accommodate both touch-tone and rotary-dial telephones in an unattended environment without operator intervention. The callers with a touch-tone telephone should have the option either to key in digits from the phone, or to speak into the voice messaging system.

2. A turn-key system must be capable of managing a multitude of incoming and/or outgoing calls and should simultaneously handle a greater number of telephone inquiries than is currently possible with existing staff. The system should provide improved service without exceeding the cost of present staff or salaries, and should be capable of expanding to meet the future demands of the installation.

3. The system should reduce or eliminate the number of lost and blocked calls coming into the DEH facility by decreasing the waiting time to receive information and expanding the capacity to handle simultaneous callers.

4. The system must allow the DEH staff to change outgoing messages quickly and easily, yet provide security through the use of access codes and passwords.

5. The system should have the capacity to contain and/or retrieve statistical or installation support information, to link the entire DEH by telephone. Such a system should be able to gather information on

a wide variety of concerns, such as work orders, claim benefits, and summary reports, and to remotely transcribe messages onto the system from clients requesting information or placing orders.

6. The system should allow access to installation support information on a virtually unlimited number of subjects to incoming callers.

7. The system should automatically identify incoming calls from specific telephones to give priority to important, sensitive, and priority calls.

8. The system should allow callers to transfer or self-direct calls to a DEH (or other) agent automatically, during or after listening to recorded information, to receive further assistance or information.

9. The system should be able to generate detailed management information reports so that system administrators can accurately monitor the usage patterns of the system.

10. In summary, a voice processing system should fully automate the numerous functions and services performed by the DEH by maximizing the use of telephone and data base automation techniques to improve service to callers, improve DEH efficiency, and substantially reduce DEH costs. It is important to recognize that a voice processing system should not replace existing DEH telephones or computer equipment, but should act as a supplementary component that adds a level of automation to enhance workforce productivity.

Current Technology

An overview of the current voice-message technology was developed by reviewing general industry literature and attending national industry-sponsored trade shows. Forty-nine current voice processing companies were selected for review from the *Data Sources*.[1] Through a company literature review and a subsequent telephone survey, the products of each manufacturer were reviewed. The group was reduced to six, comprised of the single manufacturer that meets the DEH need for a system serving both rotary and touch-tone telephones (Microlog), and five manufacturers whose systems offer a range of features that represent the industry as a whole and the current state of voice-messaging technology (manufacturer size and reputation, storage capacity, number of simultaneous users, number of ports, hours of message storage, and price):

1. Brooktrout Technologies
2. Data Acquisition Services
3. Microlog Corporation
4. VMX Incorporated
5. Wang Laboratories
6. Xerox Corporation.

All manufacturers in the voice message processing industry offer three basic features, available in either a stand-alone system (requiring the purchase of hardware), or in a subscription service provided by the manufacturer:

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[1]*Data Sources*, 2nd ed., vol. 3 (Ziff-Davis Publishing, 1990).

1. An Automated Attendant system assists incoming callers with dialing extensions, consulting directories, leaving messages, getting product information, and accessing a DEH operator. The Automated Attendant operates continuously, 24 hours per day, every day of the year.

2. A Voice Mail system networks a series of "voice mailboxes." The sender records his or her message and stores that message in the recipient's "mailbox." The recipient calls into the mailbox to play back the recorded message.

3. A Voice Response system stores data such as questions or numbers on commonly requested information or inquiries. For example, questions about employee benefits and accumulated vacation time are often asked of the DEH support staff. Through Voice Response, the caller can access this information and choose from a wide variety of prerecorded messages. Banks and mail-order businesses already use this system to allow clients to verify bank account balances or place orders over the phone.

Table 1 lists the characteristics and individual features of the six selected voice-processing systems (all of which provide the three standard features listed above). Appendix B lists further manufacturer information and study results.

Development Alternative

Since most voice message processing systems accommodate only touch-tone telephones, DEHs that plan to install such a system should consider replacing rotary-dial with touch-tone telephones. This conversion must be complete and consistent throughout the base, and should include housing divisions, to allow the system to operate to its full capability. In the long run, a complete touch-tone telephone system would encourage other voice processing companies, which currently produce systems with only touch-tone capability, to develop or modify voice processing systems that meet DEH needs, thus creating a more competitive environment among voice processing companies and resulting in a better product at a lower price.

Table 1

Features of Selected Voice Message Processing Systems

Maker	Product Name	Standalone/ Subscription	Touch-tone/ Rotary	Simul. Users	Ports	Hrs. Storage	Initial Cost	Annual Fee	Supplementary Features
Brooktrout	Operator Plus	Standalone	Touch-tone	25-500	2-6	2-24	$15,000-$60,000	No	• Will modify/upgrade system for additional charge
Data Acquisition	Multi-Line Disk System (MLDS)	Standalone	Touch-tone	100	2-100	20-40	$18,500-$156,000	Yes	• Can provide computer link to host computer
Microlog	Voice-Connect System (VCS 3500)	Standalone	Both	100	4-20	30	$16,000-45,000	Yes	• Automated Transaction Processing • Interactive Voice Response • Generates printed reports • Will modify and maintain the system at additional charge
VMX Inc.	VMX 1000 Series	Standalone	Touch-tone	50-100	4-16	13-64	$35,000-$104,000	No	• Will modify/upgrade system for additional charge
Wang	Digital Voice Exchange (DVX)	Standalone	Touch-tone	500	8-20	5-60	$20,000-100,000	No	• FORMServer • Generates printed reports • Subscription service billed monthly, dependent on no. of mailboxes
		Subscription	Touch-tone	500	8-20	5-60	$28/mailbox/mo plus fee for toll-free phone service	No	
Xerox	Xerox Voice Message Exchange (XV-MX)	Subscription	Touch-tone	100	2-64	526	$25,000-$100,000	No	• Will modify/upgrade the system for additional charge

3   CONCLUSIONS AND RECOMMENDATIONS

This study reviewed current practices at the DEH Work Order Reception Desks at Forts Leonard Wood and Eustis, and the procedures at a number of other DEHs. It was concluded that there was unmet demand for telephone answering services at those DEHs, especially during peak periods and after office hours.

This study also reviewed 49 commercial manufacturers of computerized voice message processing systems, and analyzed six systems judged to be representative of current technology. Voice message processing systems commonly offer three services, available in either a standalone (purchased) hardware package, or a subscription service: (1) Automated Attendant, (2) Voice Mail, and (3) Voice Response. A review of the features offered by the voice-messaging industry shows that integration of a voice message processing system with current DEH Work Order Reception Desk procedures may improve DEH telephone services and may yield a long-run, beneficial return on investment by increasing services with no increase in staff.

This study will conclude by installing, monitoring, both qualitatively and quantitatively testing, and evaluating a voice message processing system at Forts Leonard Wood and Eustis. Results from this study will be used to recommend the applicability of such systems to the DEH environment from the standpoints of utility and return on investment. Since Forts Leonard Wood and Eustis have combinations of rotary-dial and touch-tone systems, the tested system must accommodate both types of telephones. The results of this field test should be forwarded to the U.S. Army Engineering and Housing Support Center at Fort Belvoir, VA, for further consideration regarding Army-wide fielding.

It is further recommended that any DEH considering installation of a voice message processing system consider conversion of all rotary-dial telephones to touch-tone technology, to take advantage of the wider range of applications (and correspondingly lower prices) available to that technology.

APPENDIX A: List of Manufacturers

Name	Address	Telephone
Advanced Voice Technologies	1865 Arlane Dr. Nashville, TN 37210	615-885-4170
American Digital Voice Systems, Inc.	PO Box 523 Holmdel, NJ 07733	201-946-9288
American Telesystems Corp.	7 Piedmont Center, Ste. 200 Atlanta, GA 30305	404-266-2500
Amtel Systems Corp.	11629 W. Dearborn Ave. Milwaukee, WI 53226	800-999-8903
Applied Voice Technology, Inc.	11410 Northeast 122nd Way Kirkland, WA 98033	800-443-0806
AT&T Data Systems Group	100 Southgate Pkwy. Morristown, NJ 07960	800-247-1212
BBL Industries, Inc.	3039 Amwiler Rd., Ste. 100 Atlanta, GA 30360	800-241-5240
Boston Technology, Inc.	One Kendall Sq. Cambridge, MA 02139	617-225-0500
Brooktrout Technology	144 Gould St., Needham Executive Center Needham, MA 02192	617-449-4100
Centigram Corp.	4415 Fortran Court San Jose, CA 95134	800-942-4942
Comverse Technology, Inc.	170 Crossways Park Dr. Woodbury, NY 11797	516-921-0470
Data Acquisition Services, Inc.	1782 La Costa Meadows Dr. San Marcos, CA 92069	800-829-4246
Data Plus, Inc.	7420 Fullerton Rd. Springfield, VA 22153	800-368-3747
Digital Sound Corp.	2030 Alameda Padre Serra Santa Barbara, CA 93103	805-569-0700
Electronic Telecommunications, Inc.	3620 Clearview Pkwy. Atlanta, GA 30304	800-237-8424
Enhanced Systems, Inc.	6961 Peachtree Industrial Blvd. Norcross, GA 30092	404-662-1503
Ericsson Information System	715 N. Glenville Dr. Richardson, TX 75081	214-997-0492

Name	Address	Telephone
Executone Information Systems, Inc.	6 Thorndal Circle Darien, CT 06820	203-655-6500
Genesis Electronics Corp.	3078 Prospect Park Dr. Rancho Cordova, CA 95670	800-458-5540
Hitachi	(Telecommunications Division) 2990 Gateway Dr. Ste. 1000 Norcross, GA 30071	800-65-7500 404-446-8820
IBM (International Business Machines)	Lod Orchard Rd. Armonk, NY 10504	800-426-2468 914-765-1900
Innovative Technology, Inc.	PO Box 767370 1000 Holcomb Woods Pkwy. Ste. 422 Roswell, GA 30076	800-879-NITA 404-998-9970
Intellisystems, Inc.	9430 Topanga Canyon Blvd.. Ste. 205 Chatsworth, CA 91311	818-341-7000
Iwatsu America, Inc.	430 Commerce Blvd. Carlstadt, NJ 07072	201-935-8580
Kerygama Technologies, Inc.	60 Modular Ave. Commack, NY 11725	800-955-2422 516-864-2357
Lanier Worldwide, Inc.	(Facsimile Products Division) 1700 Chantilly Dr. NE Atlanta, GA 30324	404-329-8000
Lynx Communications Corp.	53 Winchester St. Newton, MA 02161	617-965-2000
Me-Di-Co, Inc.	2233 Northwestern Ave. Waukegan, IL 60087	708-249-1213
Mesa Computers, Inc.	4406 Birch Circle North Olmstead, OH 44170	216-779-9292
Miami Voice	5215 Northeast 74th Ave Miami, FL 33166	305-593-6077
Microlog Corp.	20270 Goldenrod Lane Germantown, MD 20874	800-562-2822 301-428-3227
Microvoice Corp.	1 Vanderbilt Irvine, CA 9271	714-859-1091
Mitel, Inc.	5400 Broken Sound Blvd., NW Boca Raton, FL 33487	800-648-3587 407-994-8500
MPSI	8848 Red Oak Blvd. Charlotte, NC 28217	704-527-8888

Name	Address	Telephone
Octel Communications Corp.	890 Tasman Dr. Milpias, CA 95035-7539	408-942-6500
Omnivoice, Inc.	PO Box 830, 280 N. Park Ave., Ste. 108 Warren, OH 44482	216-393-3246
Spectrum Communications and Electronics Corp.	62 Bethpage Rd. Hicksville, NY 11801	800-828-8255 516-822-9810
Tel Electronics, Inc.	705 E. Main St. American Fork, UT 84003	800-824-7451 801-756-9606
Telenova, Inc.	(Lexar Business Systems Division) 201 Flynn Rd. Camarillo, CA 93012	800-221-7399 800-535-7757 (CA) 805-388-5000
Tie/Communications, Inc.	4 Progress Ave. Seymour, CT 06483	203-888-8000
Toshiba America Informations Systems, Inc.	(Telecommunications Systems Division) 9740 Irvine Blvd. Irvine, CA 92718	800-222-5805 714-583-3700
VMX, Inc.	110 Rose Orchard Way San Jose, CA 95134	408-943-0878
Voice Systems & Services, Inc. (VSSI)	One Technology Center Cleveland, OK 74020	918-358-5801
Voicetek Corp.	19 Alpha Rd. Chelmsford, MA 01824	508-250-9393
Votan	4487 Technology Dr. Fremont, CA 94538-6377	800-288-4756 415-490-7600
Wang Information Services Corp. (Subsidiary of Wang Laboratories, Inc.)	One Industrial Way, Mail Stop 014-A1B Lowell, MA 01851	800-835-9264 508-459-5000
Win Communications (Subsidiary of Nissho Iwai American Corp.)	200 Oser Ave. Hauppauge, NY 11788	516-435-1100
Xerox Corp. (U.S. Marketing Group)	PO Box 24 Rochester, NY 14692	800-832-6979

APPENDIX B: Manufacturer Information and Evaluation

Company	Address & Phone	Contact	Advantages	Disadvantages
Brooktrout Technology, Inc.	110 Cedar St. Wellsly Hills, MA 02181 617/235-3026	Sales Mgr.		• Not on General Services Agreement (GSA) schedule • Requires touch-tone system
Data Acquisition Services	1782 La Costa Meadow Dr. San Marcos, CA 92069 619/471-0342	VP Marketing	• Outgoing messages can be changed by microphone, tape, or telephone • Statistical reports can be user-generated	• Not on GSA schedule • Requires touch-tone system
Microlog	20270 Germantown Lane Germantown, MD 20874 800/562-2822	National Account Manager	• On GSA schedule • Outbound dialing capability • Documents all calls • Multilingual system • Password capable • Messages can be changed remotely • Nationwide maintenance program	
VMX, Inc.	17217 Waterview Parkway Dallas, TX 75252 800/843-5399	Sales Rep.	• Mailbox capability • Modifiable system	• Not on GSA Schedule • Requires touch-tone system • Circuit boards must be set-up/maintained by VMX
Wang Information Services, Inc.	300 Park Blvd. Suite 400 Itasca, IL 60143 312/250-4614	Senior Voice Services Rep.	• On GSA Schedule • Voice Response can be integrated with data base • Voice Mail is optionally a subscription service (10 mailboxes @$28/mo, plus charge for toll-free "800" calls over 30 s in length) • Distributes announcements to specified user groups • Outdials to nonsystem recipients • Password capable • Does crew scheduling • Options include: - Digital Networking - Automated Attendant - Paging Notification - Voice Questionnaire to Callers - Audiotex (repeats information delivery)	• Requires touch-tone system
Xerox Corp.	P.O. Box 431 East Rochester, NY 800/832-6979	Lead Telemarketing Sales Rep.	• Unlimited service • No hardware purchase • Service/maintenance provided • 24-hr service • Modifiable system	• Not on GSA schedule • Depends on remote server • Requires touch-tone system • Reports generated monthly by Xerox, not by user

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  Fort Belvoir, VA 22060
    ATTN: CENAC-FB

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  Falls Church 20315
  Sunny Point MOT 28461
  Oakland Army Base 94626

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